

REMARKS

Claims 1-8 are pending in this application. Claims 1 and 8 are independent claims. Claims 2-7 are dependent claims.

Claims 1, 3, 4, 6, and 8 have been rejected. The Examiner objected to claims 2, 5, and 7 as being dependent upon a rejected base claim, but indicated that these claims would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Amendments to claims 1-8 are presented herein. The specification has been amended to improve form. No new matter is being presented, and approval and entry are respectfully requested.

Changes To The Specification

Changes have been made to the specification only to place it in preferred and better U.S. form for issuance. No new matter has been added.

Rejections Under 35 U.S.C. §§ 102 and 103

In numbered paragraph 2 on pages 2 and 3 of the Office Action, the Examiner rejected claims 1, 3, and 6 under 35 U.S.C. § 102(e) as being anticipated by Kandel et al. (U.S. Patent No. 6,353,671).

In numbered paragraph 4 on pages 3 and 4 of the Office Action, the Examiner rejected dependent claim 4 under 35 U.S.C. § 103(a) as being unpatentable over the Kandel reference in view of Tong et al. (U.S. Patent No. 4,441,202).

Also, in numbered paragraph 5 on page 4 of the Office Action, the Examiner rejected independent claim 8 under 35 U.S.C. § 103(a) as being unpatentable over Kandel in view of Tong.

Applicant respectfully traverses these rejections for the reasons presented below.

Claim 1 recites, as amended, "an input unit into which acoustic signals are input; a detector detecting a frequency band having a highest energy level among frequency bands

comprising the acoustic signals input into the input unit; and a variable equalizer maintaining the energy level of the acoustic signals input into the input unit substantially at a constant level for frequency bands lower than the frequency band detected by the detector, and increasing the amplification degree of the energy level of the acoustic signals input into the input unit as the frequency increases for the frequency bands higher than the frequency band detected by the detector."

An acoustic signal includes frequencies called a first formant, a second formant, a third formant, etc. Sounds are recognized by separating and detecting the first formant, the second formant, the third formant, etc. Auditory senses have masking effects. A masking range due to the first formant can cause the formants other than the first formant to be masked, especially for individuals with hearing impairment. If the sound level is increased, the first formant also increases, which further expands the masking range. As a result, it becomes more difficult to detect second, third, etc. formants.

The present invention is able to generate acoustic signals with amplified second, third, etc. formants, without amplifying the first formant. Thus, the masking range does not increase and the levels of the second, third, etc. formants can be detected, and the sound can be recognized.

The Kandel reference relates to a signal processing circuit for increasing speech intelligibility. Kandel does not disclose the detector recited in claim 1 that detects the frequency band having the highest energy level among the acoustic signals, or the variable equalizer of claim 1 that variably amplifies the frequency bands based on the result of the detector. Kandel simply amplifies predetermined fixed frequency bands without detecting the frequency band having the highest energy level among the input acoustic signals. Because the present invention can vary the frequency band for amplification according to the frequency characteristic of the acoustic signals, it is possible to clearly and easily hear the acoustic signals while substantially maintaining the original characteristics of the acoustic signals.

The Examiner has asserted that the mixer 113 of Kandel discloses the "detector" (originally the "determination unit") of claim 1. However, the mixer 113 of Kandel does not detect any frequency bands, but, rather, merely mixes signals from the exterior microphone 112 and the interior sensor 118 through the filter 120. Thus, the mixer 113 does not detect a

frequency band having the highest energy level of the frequency bands included in the input acoustic signals.

Also, the gain amplifier 122 of Kandel operates as a low-pass filter that passes the frequencies less than 1 kHz, and the gain amplifier 114 operates as a band-pass filter that passes frequencies between 1 kHz and 3 kHz. The filter 115 operates as a narrow-band filter that passes a frequency of tone T (i.e., a 6 kHz predetermined fixed frequency), and the amplitude demodulator 116 operates as a low-pass filter that detects the level of tone T to control the gain of the gain amplifier 114. Thus, Kandel does not disclose detecting a frequency band having the highest energy level among the frequency bands included in the input acoustic signals.

Further, the Examiner has asserted that the "variable equalizer" of claim 1 is disclosed by the gain amplifier 114, the filter 115, and the amplitude demodulator 116 of Kandel. However, the filter 115 and the amplitude demodulator 116 are merely filters that do not amplify the gain of the input signals. While the gain amplifier 114 may amplify the frequencies of the signals, the frequency range amplified by the gain amplifier 114 is fixed between 1 kHz and 3 kHz and the amplified frequency range is not variable. Thus, the gain amplifier 114, the filter 115, and the amplitude demodulator 116 of Kandel do not operate as the variable equalizer of claim 1. Accordingly, Kandel does not disclose varying the frequency band for amplification according to the detected frequency band, or that the frequency range of the formants changes over time.

Thus, it is submitted that claim 1 patentably distinguishes over the prior art.

Similar to claim 1, independent claim 8 recites "an A/D converter digitizing input acoustic signals; and a processor comprising a micro-processor or a digital signal processor to generate digital acoustic signals, perform frequency analysis on the digital acoustic signals input from the A/D converter, and amplify frequency bands higher than a frequency band at which an energy level is highest among the digital acoustic signals input from the A/D converter."

The Examiner has relied on Tong as disclosing an A/D converter. However, Tong adds nothing to Kandel with respect to the features of the invention discussed above. Thus, it is submitted that claim 8 patentably distinguishes over the prior art.

As for dependent claims 2-7, the dependent claims depend from the above-discussed claim 1 and are patentable over the prior art for at least the reasons discussed above.

Therefore, Applicant submits that claims 1-8 patentably distinguish over the prior art. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejections under §§ 102 and 103.

Request for Return of Attachment 1(g) of Information Disclosure Statement

On December 3, 2003, Applicant filed an Information Disclosure Statement (IDS) with Attachment 1(g). A copy of Attachment 1(g) has not yet been returned to Applicant to confirm that the references cited therein have been considered. Accordingly, it is requested that the Examiner confirm consideration of these references by initialing and returning Attachment 1(g). For the Examiner's convenience, copies of the IDS, Attachment 1(g), and the stamped postcard are attached to this response.

Conclusion

It is submitted that neither of the references, either taken alone or in combination, teaches the present claimed invention. Thus, claims 1-8 are deemed to be in a condition suitable for allowance. Reconsideration of the claims and an early Notice of Allowance are earnestly solicited.

If there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

Finally, if there are any additional fees associated with filing of this response, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

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